



UNIVERSITY OF  
CAMBRIDGE | **Electricity Policy  
Research Group**



# Are Low Carbon Policies Affordable?

**David Newbery**

Renewable Energy Foundation

*Are Low Carbon Policies Affordable?*

St George's House Windsor Castle 28<sup>th</sup> October 2010

<http://www.eprg.group.cam.ac.uk>

# Outline

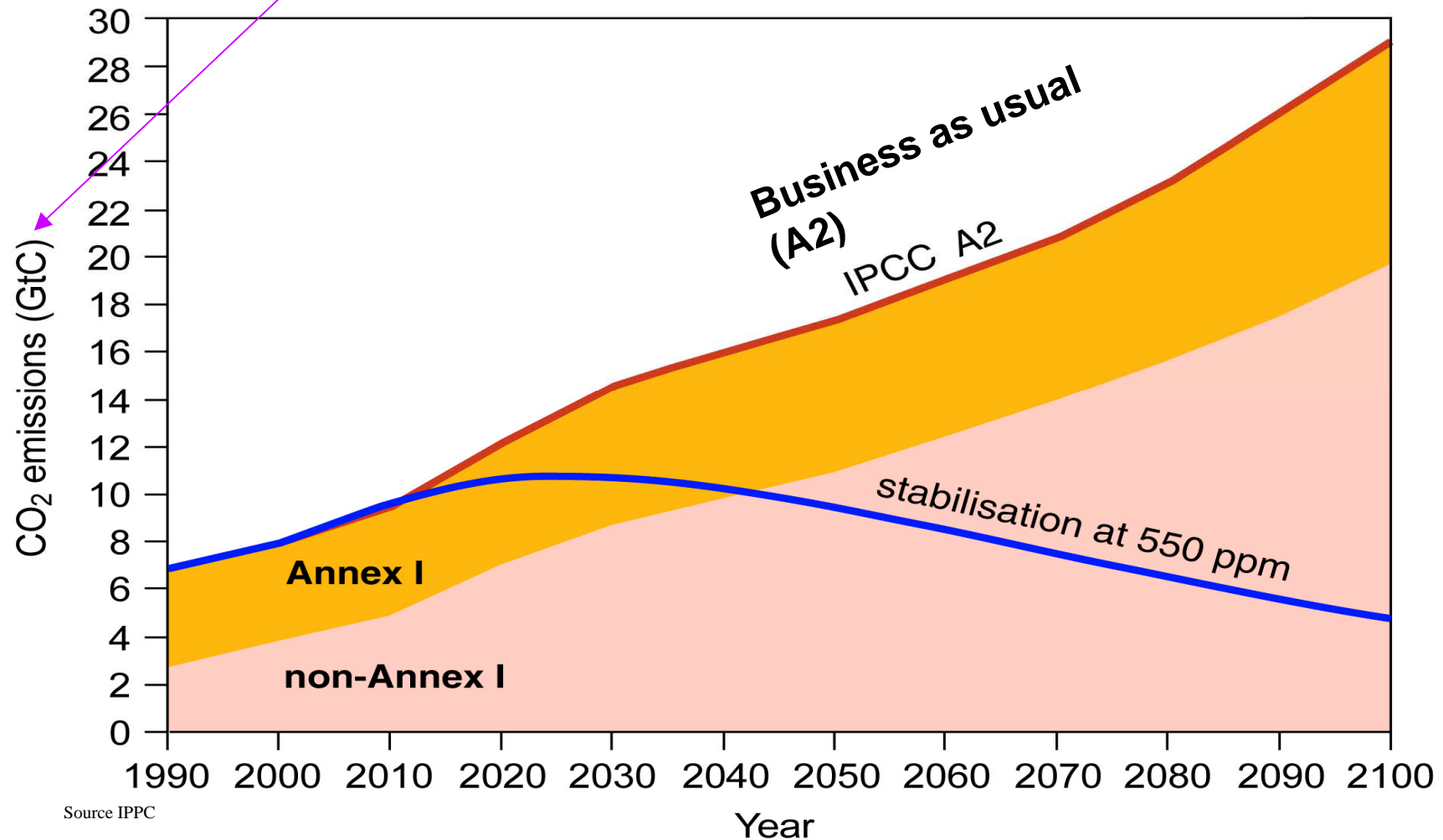
- Can the world afford low-C policies?
  - Will we be able to agree on actions?
- Can the developed world pay the price?
  - What is the role of the EU and UK?
- Can the UK afford low-C policies?
  - What is needed to deliver **low-C Britain**?
- Are we pursuing sensible low-C policies?
  - If not what is wrong and what should we do?

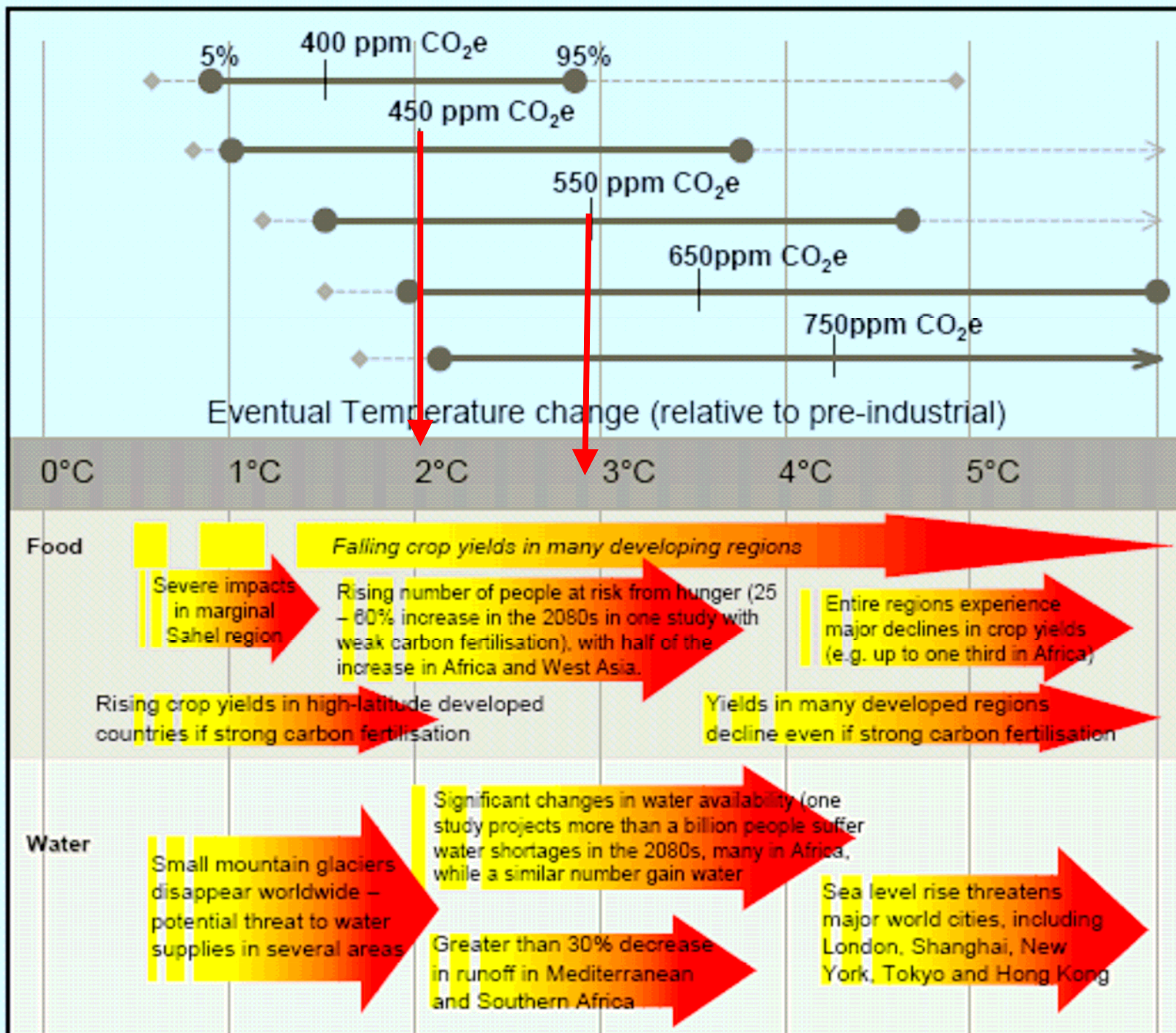
# Bottom line

- UK low-C targets: £200 billion by 2020
    - = £700 per household per year for 10 years
    - partly to replace obsolete plant
    - but much in extra cost of renewables
  - Why subsidize renewables?
    - => burden sharing under **Renewables Directive**
    - justified by learning-by-doing
- Aim to deliver agreed goal at least cost***

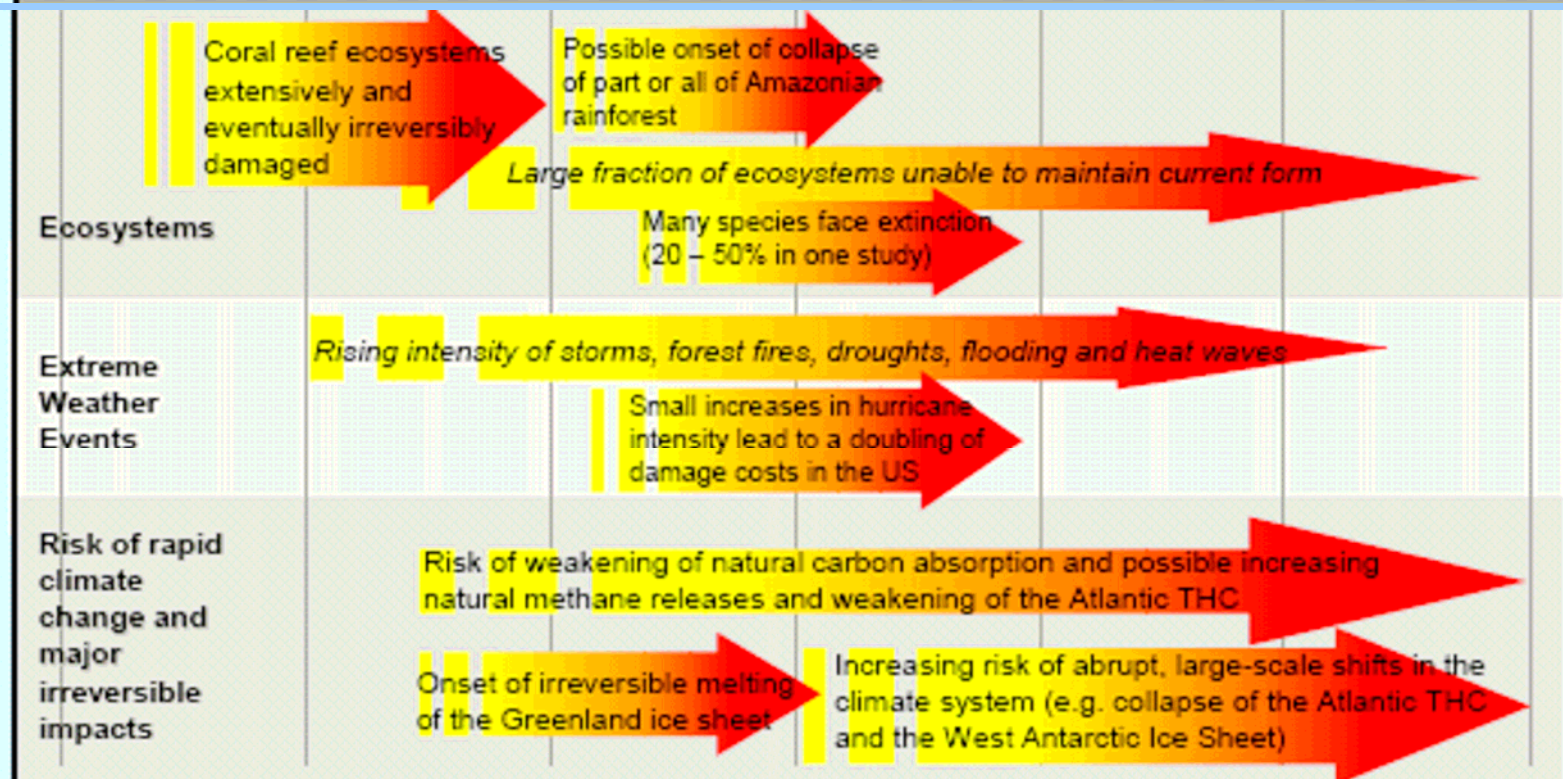
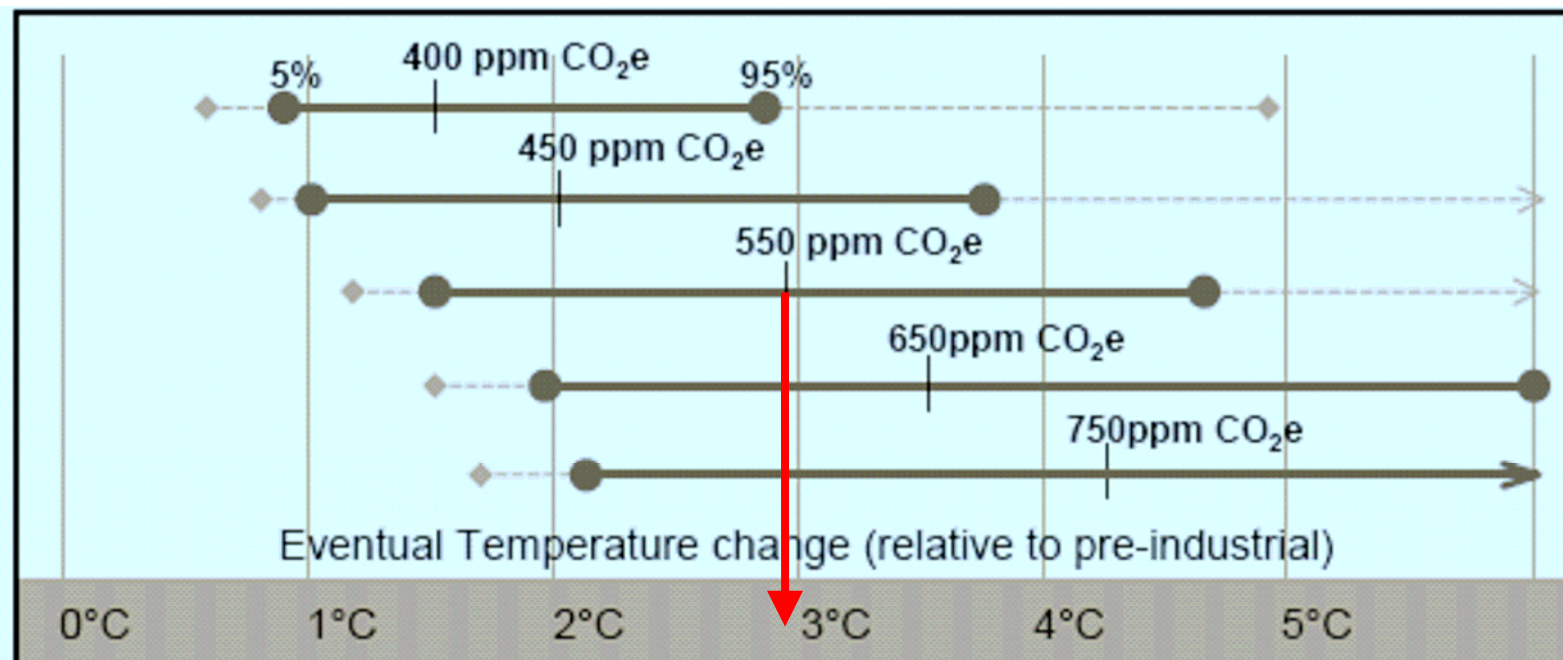
# Emissions pathway to stabilise at below 550 ppm - but 450 ppm needed to stay below 2°C

Note 1GtC=3.67 Gt CO<sub>2</sub>











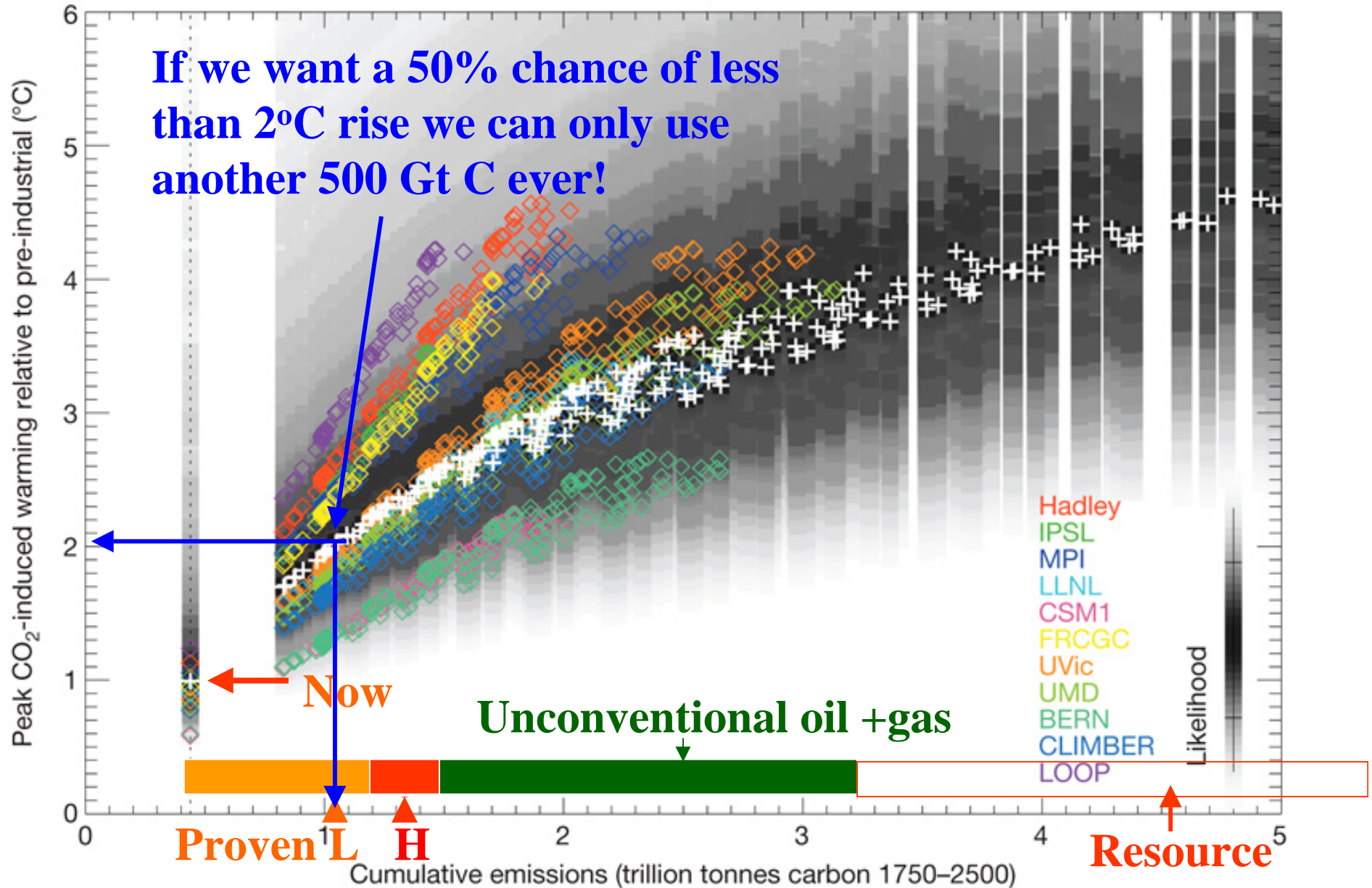
# Climate change challenges

- World should not release all C from fossil fuels
- Climate policy risks depressing fossil fuel prices
  - unless CCS on major scale?
- Current low-C technologies not yet competitive
  - especially given low EUA price
- How best to drive down clean energy costs?

*Research, Development, Demonstration and  
Deployment*

# Peak CO<sub>2</sub>-warming vs cumulative emissions 1750–2500

Relative likelihood of peak warming versus cumulative emissions







# Ethics and economics

- Stern: “Climate change ... **is the greatest and widest-ranging market failure ever seen**”
  - CO<sub>2</sub> is a persistent global stock pollutant
    - emissions anywhere affect all for centuries
    - uncorrected free markets will fail to charge true cost
    - global public bad requires collective action
- => Least cost solution: **all agents face carbon price**

***What price? Who should pay?***

# Putting a price on carbon

- Social cost = present cost of future damage
  - Who counts? How much? How uncertain?
- Stern - utilitarian social welfare viewpoint
  - all count, how much depends on discount rate
  - Stern takes pure time preference at 0.1%
  - social damage inverse to consumption level
  - => ethical appeal - lives of poor as valuable as rich
  - => solves problem of risk => insurance valuable

*time scales of centuries, huge uncertainty*

# Effect of discounting

Share of total damage occurring after 2200 at different rates of pure time preference

- at 0.1%: **52-57%** depending on scenarios
- at 1%: 16-19%
- at 3%: **0-3%**

***High discount rates => trash the planet***

# *Social cost of carbon (SCC)*

- SCC = damage caused by extra tonne of carbon equivalent of GHG released now
  - rises at discount rate
- Stern: \$85/t CO<sub>2</sub> = \$312/tC
  - coal 1990-2004: \$40-60/t, with 0.8-0.9 tC/t coal
- ETS price 13 €/t CO<sub>2</sub> = \$19/t CO<sub>2</sub> = \$70/tC
- DEFRA SCC= £26.5/tCO<sub>2</sub> = 31 €/t CO<sub>2</sub>  
=£97/tC= \$160/tC



## So what should it be?

- Pragmatism: what is needed to avoid disaster?
  - = Predictable, credible rising future C price
    - sufficient to induce low-C investment (nuclear, wind)
    - based on costs of delivery, avoids ethics (somewhat)
- collective agreement - we each worry about our own descendants
  - => encourage agreement - ***bribes and penalties***  
***Transfers to non annex I, border C taxes?***



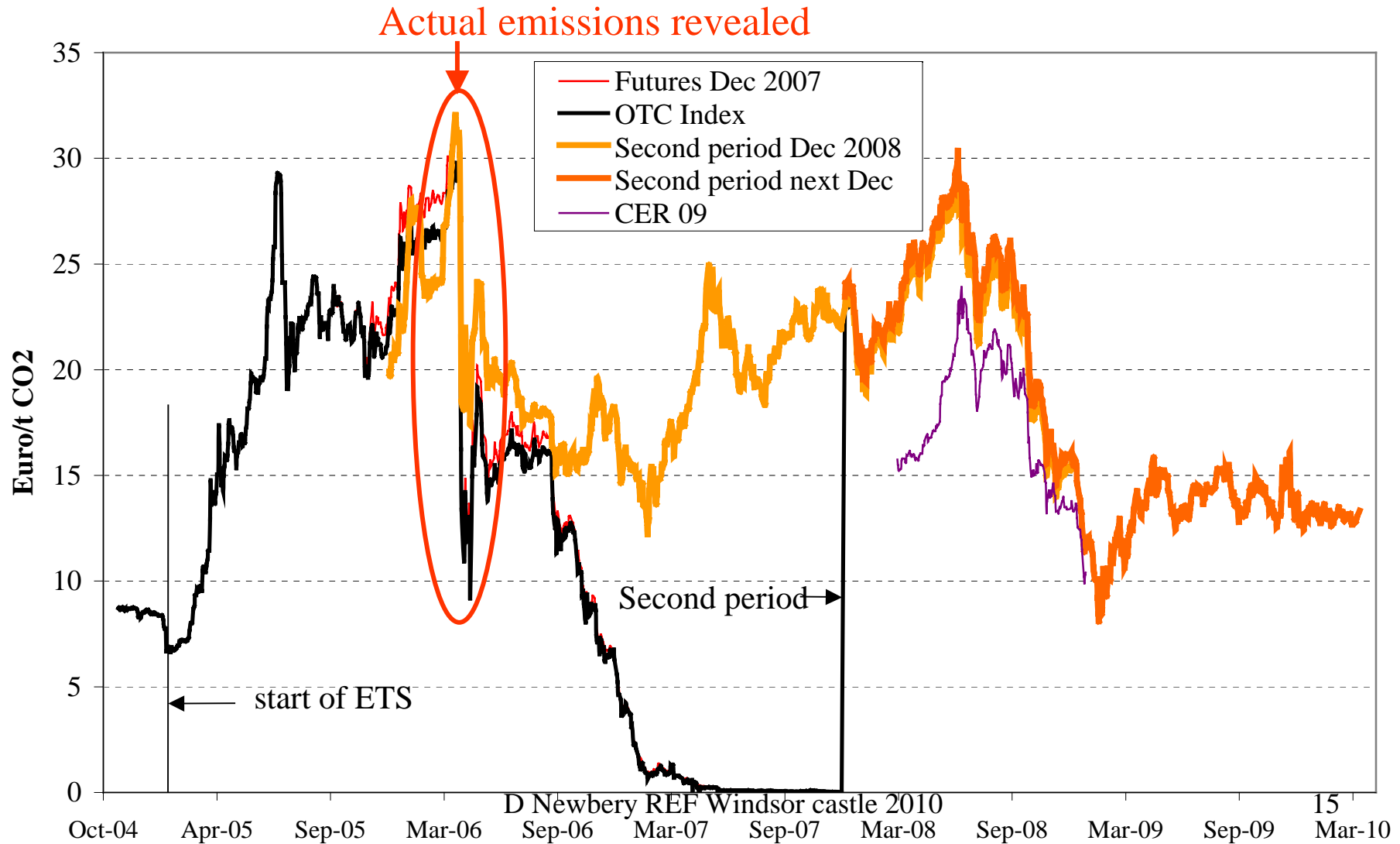
# EU climate change policy

- **ETS** to price CO<sub>2</sub>
  - fixes quantity not price => **poor guide for low-C**
- **20-20-20 Directive**: demand pull for renewables
  - justified by learning spill-overs and burden sharing
    - each country must do an appropriate part
- **EU SET-Plan** to double R&D spend
  - to support less mature low-C options

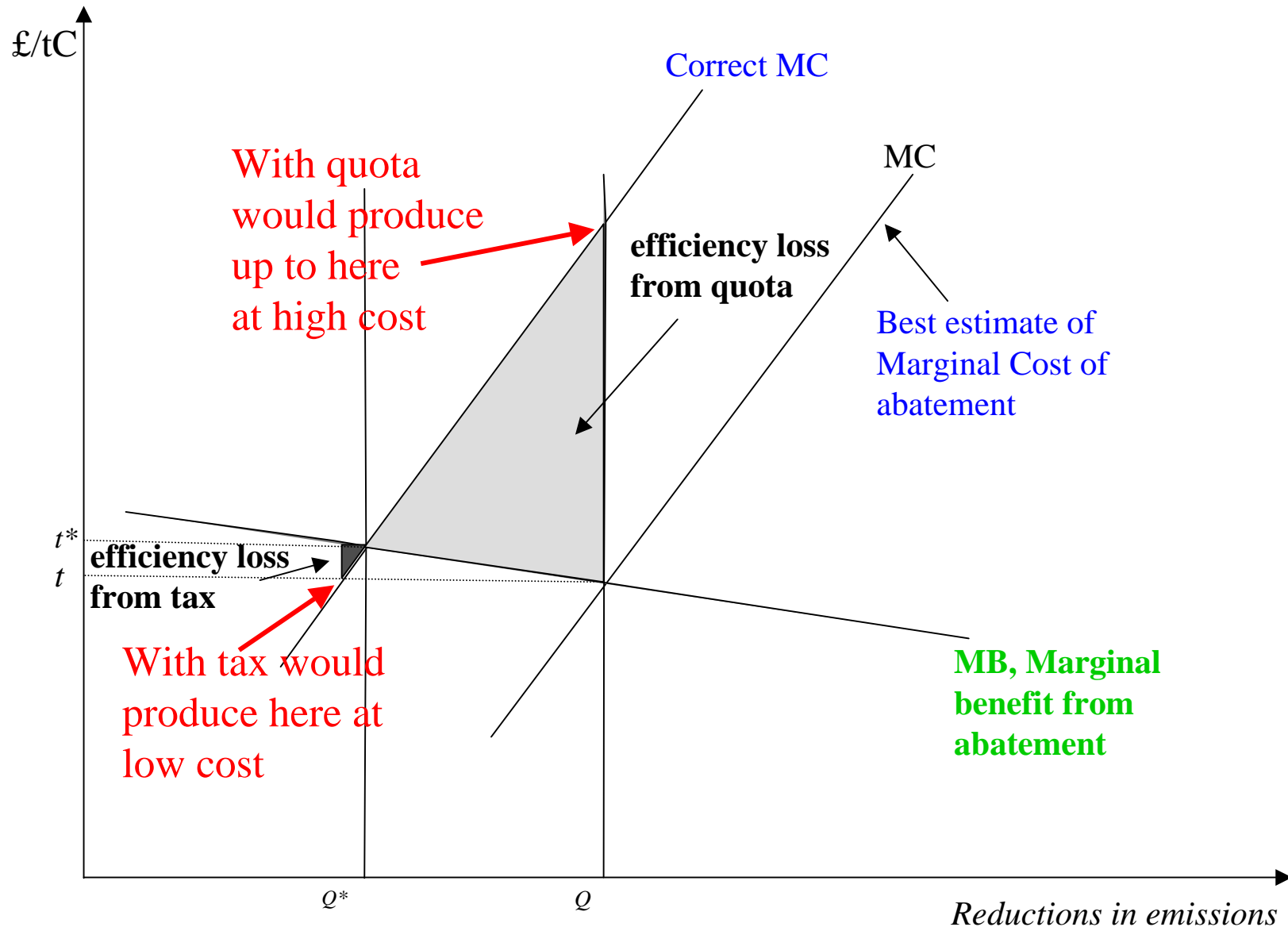
***But ETS and Renewables Directive conflict***

# CO<sub>2</sub> prices are volatile and now too low

## EUA price October 2004-April 2010



# Costs of errors setting prices or quantities

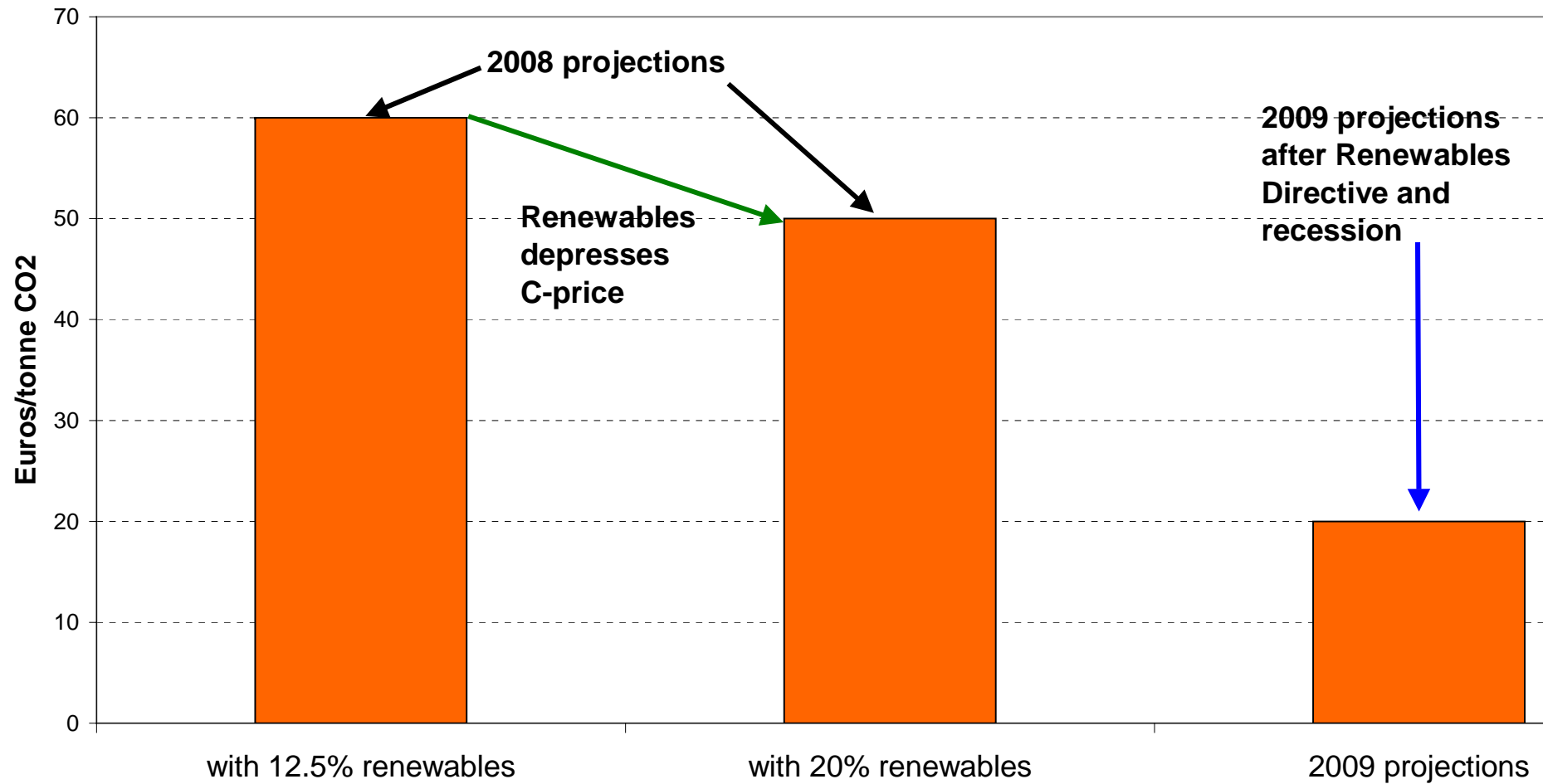


# Failures of ETS

- Current ETS sets quota of total EU emissions
  - **Weitzman argues for tax/charge not quota**
- Renewables Directive increases RES
  - => increased RES does not reduce CO<sub>2</sub>
  - => reduces price of EUA
  - => prejudices other low-C generation like nuclear
- Risks undermining support for RES

***Solved by fixing EUA price instead of quota***

## 2020 projected CO2 price



Source: Committee on Climate Change, 2008 and 2009

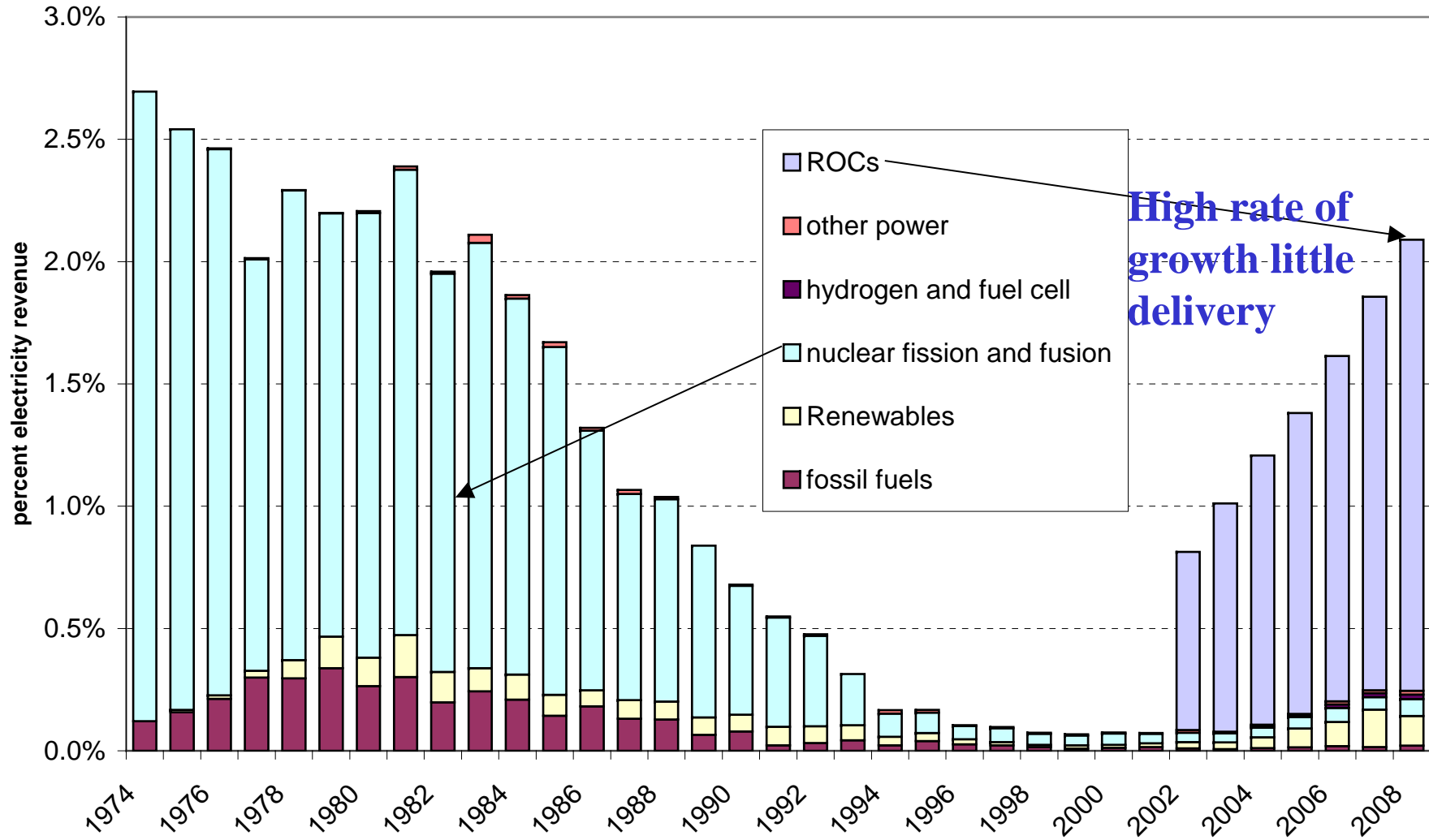


# Reforming ETS

- Reform EU ETS to provide **rising price floor**
  - sufficient for nuclear *or on-shore wind if cheaper*
  - ⇒ Carbon Bank trades EUAs to stabilise price
- Commitment to raise CO<sub>2</sub> price at 3% p.a. over life of plant may suffice
  - €25/EUA 2010 ⇒ €34 in 2020, €61 in 2040 ...
- Making it credible: write CfD on this path
  - remove uncertainty for low-C generation investment

***makes extra carbon savings additional***

# UK Electricity R&D intensity

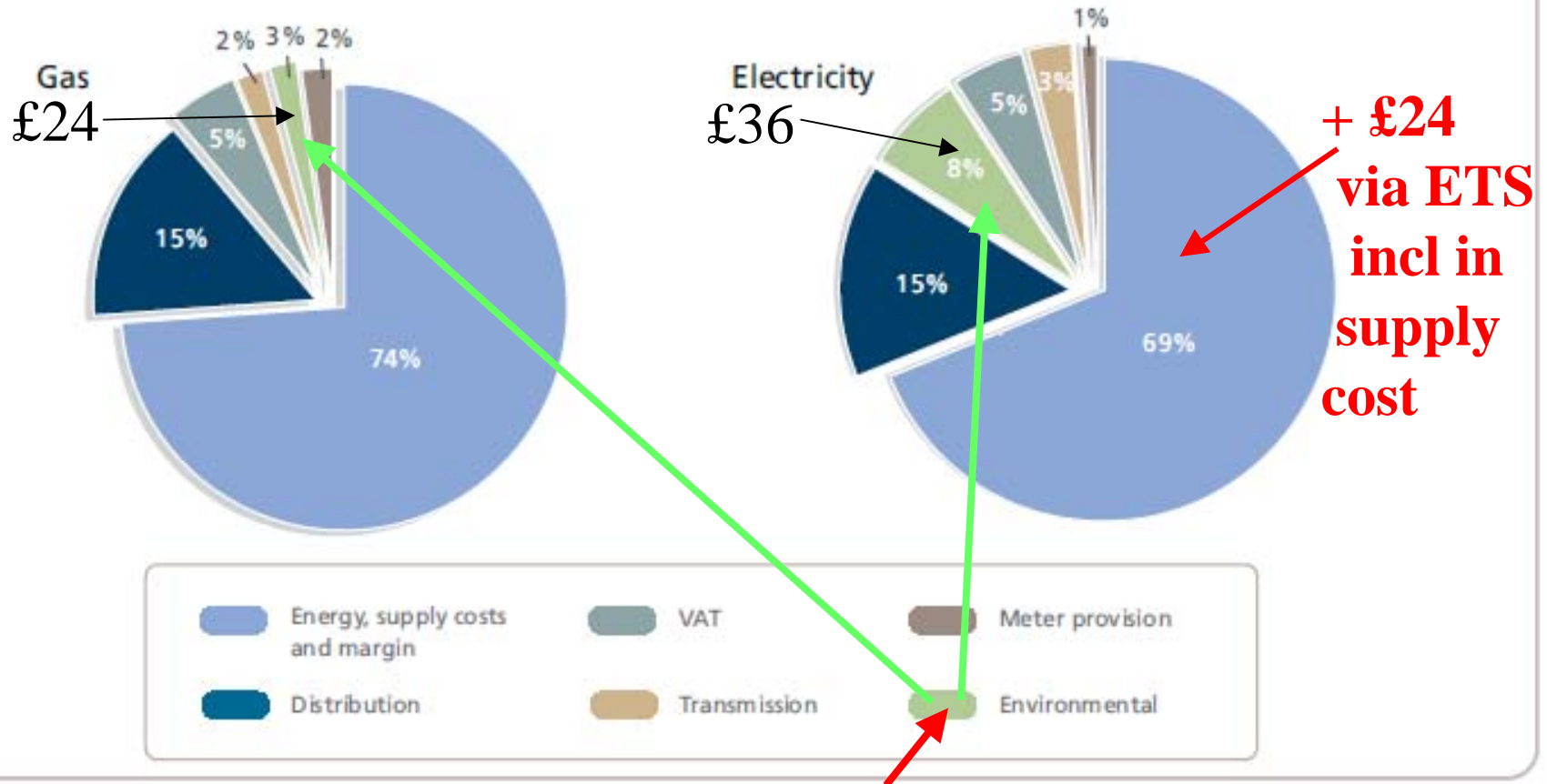


# What of UK energy policy?

- Renewables Directive as burden-sharing sound
  - but risk that we all chase cheapest solution
  - least bad solution to problem?
- UK promotes renewables via ROCs
  - costly => large windfalls, replace with FITs?
  - Small scale wind encouraged by silly FIT
- **Good news:** low carbon network fund
  - induces innovation to overcome barriers
- **Bad news:** planning still a mess, leading to very expensive off-shore solutions

# Domestic fuel bill breakdown 2009

Breakdown of gas and electricity bills. This reflects current gas and electricity prices in June 2009. The current average gas bill for a quarterly credit account is £800 and for electricity it is £445.



**Proportionately nearly 3 times higher on elec than gas**

# Affordability (climate change)

- Average domestic electricity bill **£400/yr**
- Main programmes
  - EU Emissions trading scheme **£24**
  - Carbon Emissions Reduction Target\* **£15**
  - Community Energy Savings Programme\* **£1**
  - Renewables Obligation **£12**
  - Total (annual cost) = **£52**  
**=13% of total bill**
  - Subsidy from reduced VAT **(£53)**

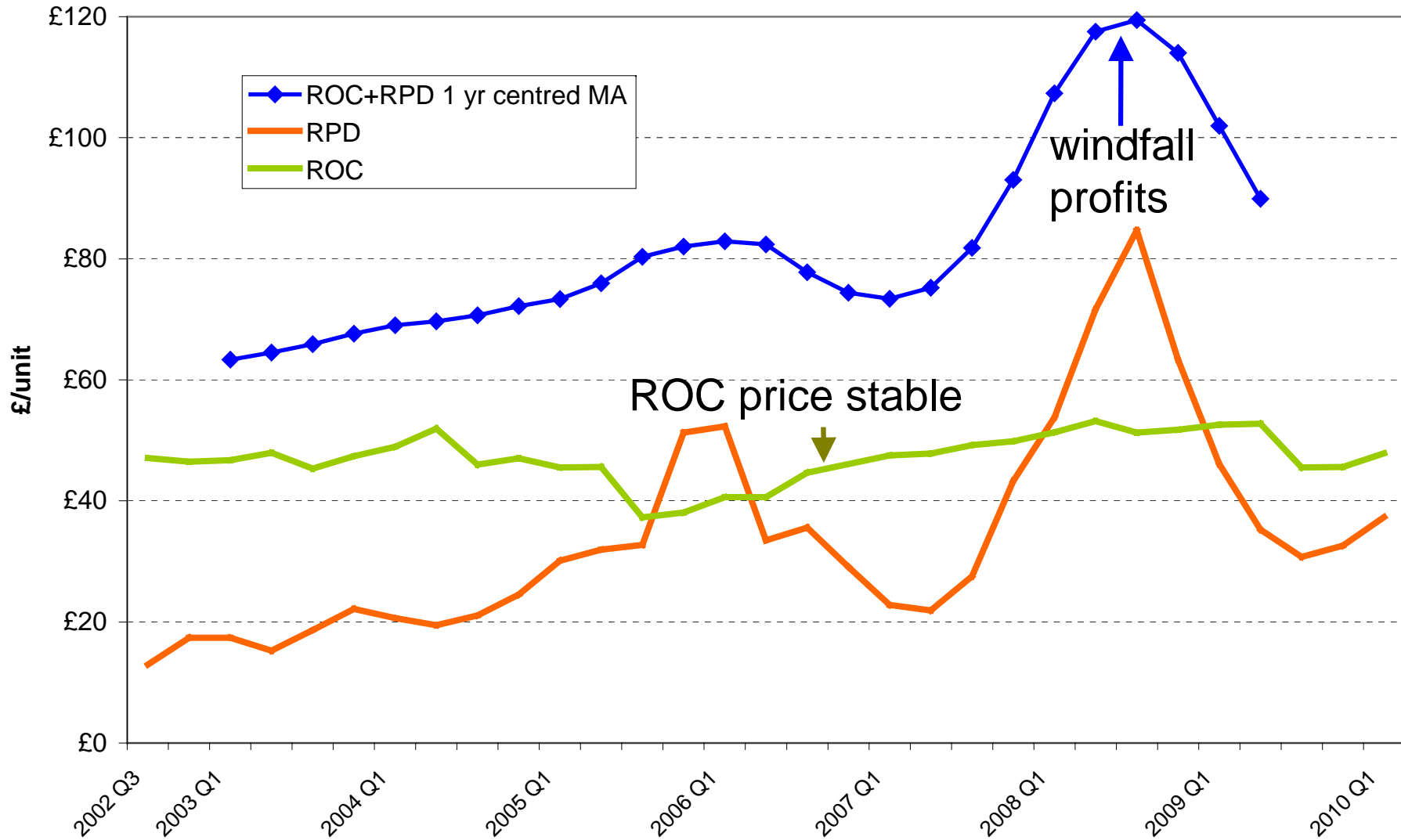
\* allocated pro-rata to expenditure on electricity and gas



# UK Renewables policy

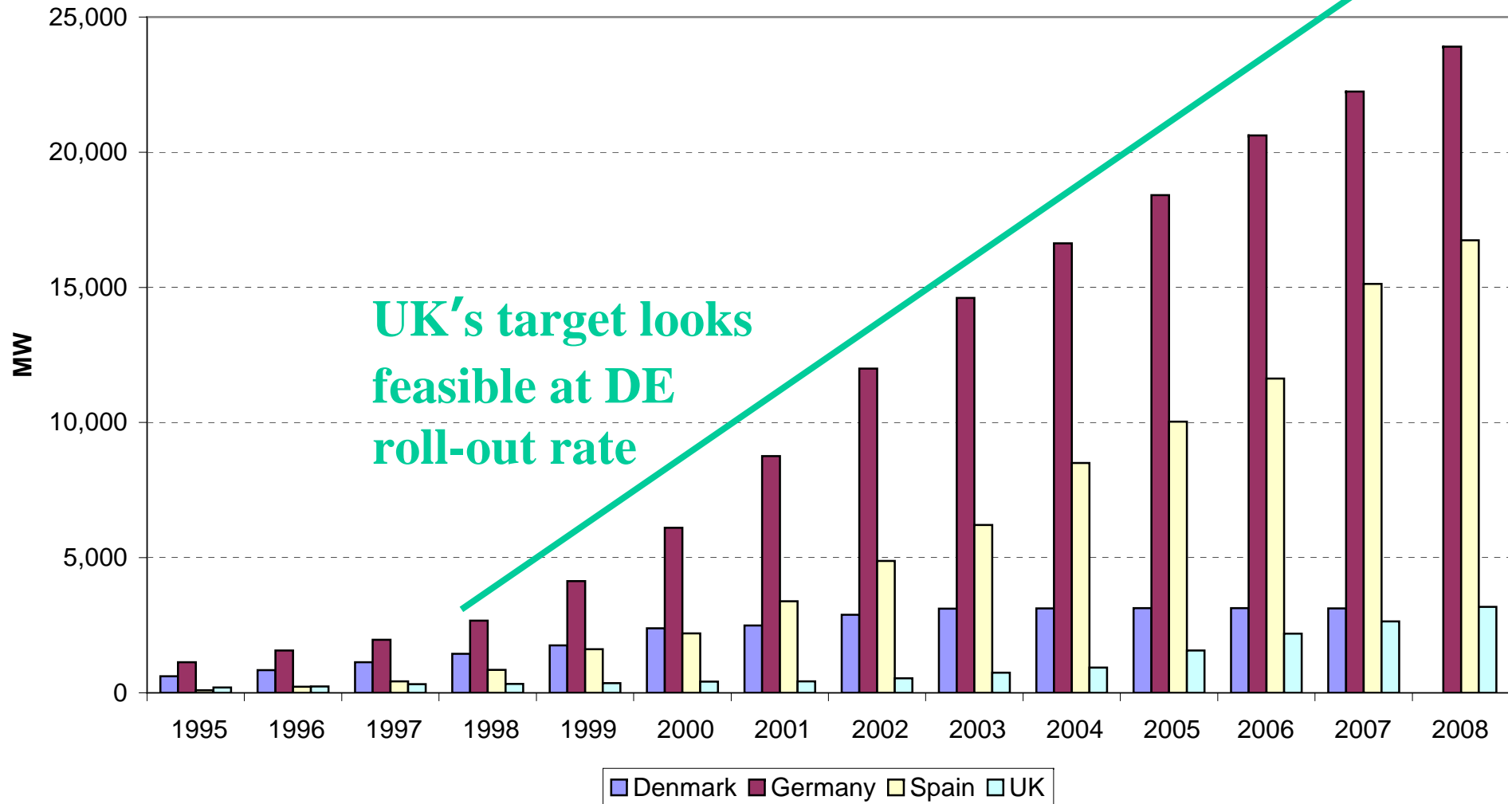
- ROCs are expensive
    - reward scarcity, deter entry, discourage localism
  - The problem is planning
    - coalition has abolished IPC (but that was not suited to on-shore wind anyway)
- => Separate system planning (SP) from TSO
- => SP finds optimal RES sites, secures consent
- => runs tender auctions for least cost FIT

# UK ROC, EUA, and electricity prices



**CCC'09 UK 2020 target is 27,000 MW**

### Installed wind capacity



# What to do?

1. An adequate credible durable carbon price  
=> carbon tax plus CfD
2. most socially beneficial portfolio of RES  
=> tender auctions for preferred portfolio
3. Least cost investment in capital-intensive kit  
=> reduce risk with long-term contracts
4. Least cost delivery  
=> reform market, nodal priced dispatch



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